THE PRESENT METEOROLOGICAL NEEDS OF AERONAUTICS

By F. W. REICHELDERFER, Lieutenant, U. S. N.

[Bureau of Aeronautics, Washington, D. C.]

[Read before the American Meteorological Society, Washington, D. C., May 1, 1925. Abstracted by B. M. Varney.]

Pointing out that present-day aircraft are in surprising measure independent of weather conditions, the paper indicates the items relative to which the aviator needs more detailed information than he now has at his disposal.

In general it is the violent or the highly localized weather phenomena that must be guarded against. Thus, thunderstorms, heavy rains, low clouds, or dense fog can sometimes be avoided by detouring if the aviator is forewarned of their occurrence. The trend of official activity toward providing him with forecasts which attempt to give *details* of the probable weather in addition to the general forecast is shown by the conferences now in progress between the Government bureaus directly interested in aeronautics, including the Weather Bureau.

Two difficulties are inherent in the *general* flying weather forecast. The time of issue, necessarily placed at about 10 a. m. and 10 p. m., seventy-fifth meridian, is obviously unsuitable for the purposes of the aviator about to make an early morning start on a long flight; and the need for brevity in the general forecasts deprives the aviator of, to him, important details as to kind, time, locality, intensity and duration of the local weather phenomena he is likely to encounter. The following quotation from Lieutenant Reichelderfer's paper well illustrates the sort of difficulty that may arise:

> The general forecast of "overcast sky" may on one occasion cover the condition when clouds are several thousand feet high and of no practical importance to the aviator, while on another occasion, the overcast sky may consist of low clouds which obscure the landing field and make flight next to impossible. Again the forecast "low clouds and rain" may describe anything from low stratus several thousand feet thick with heavy rain, to thin stratus and an occasional sprinkle. The one is next to impassible; the other is of little consequence.

Reports of current and of recently passed weather conditions from stations along a contemplated line of flight are now customarily obtained. Though they are in no sense forecasts, such reports are very helpful in giving some idea of the extent of important phenomena and hence constitute a useful supplement to the general forecast. This is clearly an intermediate step toward the ultimate provision of detailed flying weather forecasts.

> Good visibility is one of the most important meteorological conditions to the aviator. If he can see, he does not care so much about rain, snow, clouds, or high winds. * * * Unfortunately, visibility is one of the very difficult things to forecast. Poor visibility, as the aviator sees it, may be caused by fog, by haze or smoke, or by low clouds. Any of these interfere with landing maneuvers and increase the difficulties of navigation. * * * Probably an increased demand for visibility forecasts will stimulate investigation into this subject and better means of forecasting it will be developed. In the meantime frequent reports of visibility are the best means the aviator has of determining how far he can see. * * *
>
> The psychological effect on the aviator and passengers of a foreknowledge of weather conditions is in itself sufficient reason for a regular weather service for scheduled flights. When the plane runs into thickening weather, the pilot will know whether he can soon run out of it, or whether it will continue to grow worse. He will know whether to seek a safe landing place or to continue, assured of running into better weather. This psychological advantage has a large economical value. An incident which occurred a few months ago serves as an example. Two planes started out from Washington to fly to New Jersey. They were not flying in company. One flew at comparatively low altitude to avoid head winds which were reported at higher levels. As he approached Baltimore the weather grew thicker, the visibility becoming alarmingly poor. It appeared still more threatening ahead, and from the plane, which was flying at about 2,500 feet, the conditions seemed to be growing momentarily worse in every direction. The aviator climbed a few hundred feet in an effort to get above the thick weather. He saw no improvement and observations of the air above him indicated that the conditions extended to several thousand feet altitude. By this time visibility was so low that flying became difficult. In flying parlance it was thick as "pea soup." Concluding that a storm was forming, the pilot turned back for Washington. The other plane, which was faster and had climbed to 5,000 feet reached its destination in New Jersey without difficulty. It reported, however, that it encountered an unusually dense haze between Baltimore and Philadelphia, extending up to 5,000 feet altitude, which completely obscured the ground. A dense haze, apparently a combination of smoke with true meteorological haze, is characteristic of some localities under certain conditions. It is also characteristic that the haze is sometimes very difficult for an aviator flying into it gradually to distinguish from the gradual thickening and clouding over which comes in the formation of some heavy thunderstorms. Such meteorological formations have an appearance when viewed from an airplane at high altitudes very different from that at the surface and are rather difficult to identify.

The meteorological problems of the lighter-than-air ship, while in many respects similar to those of the heavier-than-air, are in certain respects different. The lighter-than-air ship does not have to keep moving to remain aloft. Hence the effects of fog or poor visibility can be countered by hovering. Gales, as affecting the overground speed of the ship, are at present perhaps the item of greatest importance, as either a help or a hindrance to progress. Hence the need for a knowledge of the extent, duration, and other characteristic details which can not practically be included in the general gale warnings has resulted in the assignment to the technical staffs of airship units of a meteorologist—

> who has given special study and had experience in furnishing the kind of weather information which the airship requires. In doing this the meteorologist usually combines with his knowledge of the weather map the ability to interpret local observations. To prepare a weather map he must, of course, call upon the Weather Bureau for complete synoptic reports. Until such time as airship ports are plentiful and airships have a selection of places in which to refuel when head winds deplete their fuel supply it is probable that bases will require synoptic weather reports as they do at present in order that the airship meteorologist can draw his complete weather map and prepare the detailed inferences required. Perhaps even when airships become common it will be found most economical to have a meteorological observatory at each large base and an airship meteorologist to give the detailed information which is essential to most efficient operation and which can not be completely anticipated in a published forecast.

Selection of favorable flying levels in relation to speed and direction of air movement will become increasingly important, and methods must be devised for extending our aerological observations to include the getting of information from above a cloud cover—a matter quite as important to the meteorologist as to the aviator.

It appears that the large amount of meteorological detail desired by aviation will gradually result in an increase in the amount of local data included in weather reports, an increase in the frequency of reports, and possibly the preparation of more detailed flying forecasts by local meteorologists. It seems certain as the demands become more insistent and the benefits are shown to be worth the increased cost that funds for the purpose will be appropriated.

56302—25†——2